Coronal Mass Ejections

A dissertation submitted to the University of Dublin
for the degree of *Philosophiæ Doctor (PhD)*

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Declaration

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work.

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Summary

Coronal mass ejections (CMEs) are large-scale eruptions of magnetized plasma from the low solar atmosphere into interplanetary space. With energies of up to 10^{26} J, they are the most energetic eruptive phenomena in the solar system and are also the driver of radio-bright plasma shocks from the corona into the heliosphere. However, the nature of the forces governing their eruption, and how this eruption drives a radio bright shock, is poorly understood.

For my parents.

Acknowledgements

Some sincere acknowledgements...

List of Publications

1. **Carley, E. P.**, MacAteer, R. T. J., & Gallagher, P. T.
   "Coronal Mass Ejection Masses, Energies, and Force Estimates Using *STEREO*",
   The Astrophysical Journal, Volume 752, Issue 1, article id. 36, 8 pp. (2012).

2. Zucca, P., **Carley, E. P.**, McCauley, J., Gallagher, P. T. ,Monstein, C., & MacAteer, R. T. J.,
   "Observations of Low Frequency Solar Radio Bursts from the Rosse Solar-Terrestrial Observatory",
   Solar Physics, Volume 280, Issue 2, pp.591-602. (2012).

3. **Carley, E. P.**, Long, D. M., & Gallagher, P. T.
   "Shock Acceleration of Energetic Particles in the Solar Atmosphere",
   Some Journal, Volume X, Issue Y, article id. (2013)

4. Zucca, P., **Carley, E. P.**, Bloomfield, S. D., & Gallagher, P. T.
   "Density and Alfvén....",
   Some Journal, Volume X, Issue Y, article id. (2013)

5. Bloomfield, S. D., **Carley, E. P.**,
   "A Comprehensive Overview of the 2011 June 7 Solar Storm",
   Astronomy & Astrophysics, Volume X, Issue Y, article id. (2013)

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1 Introduction

The Sun has long been the focus of humanity's curiosity. Throughout history it has been the harbinger of new religions, philosophies, and sciences. It has changed our understanding of our place in the Universe and allowed us to push forward the frontiers of physical science. Although our understanding of the Sun is nowadays more advanced, the curiosity we hold for it has not changed since the very early humans. Now, we understand the Sun is a star similar to any other in its class, currently going through a relatively unchanging 11 year cycle of activity from solar minimum to solar maximum and back again. Most of the phenomena described here result mainly from the energetic processes occurring during solar activity maximum.

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A

A Nice Appendix

This is where the appendix would go...

References

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